

The TMS2 Solution for full PSS Compliance

The TMS2 PSS system is an intelligent aftermarket system which enables legacy fleet to obtain the HGV Safety Permit. It can be used in conjunction with existing camera- based systems and replaces and updates the existing detection system.

Our system addresses the TfL PSS safety regulations by ensuring the driver is made aware of the presence of vulnerable road users (VRUs), such as pedestrians and cyclists, who are approaching or within the close-proximity blind spots of the vehicle e.g. either directly in front of the vehicle or in the nearside blind spot.

Radar and cameras are the two main technologies commonly employed to meet the TfL PSS standards. These are two different sensor technologies with distinct advantages and limitations. After extensive research we have adopted a radar-based system as our solution, based on the following reasons:

Weather Conditions

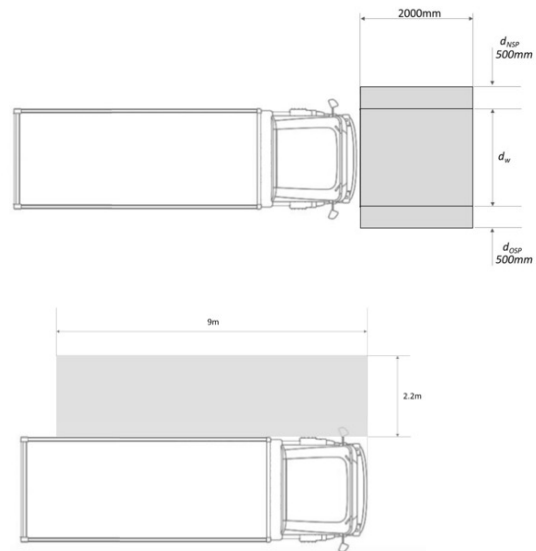
Radar is less affected by adverse weather conditions such as heavy rain, fog, or snow compared to cameras. Radar waves can penetrate through these weather elements, providing more reliable detection in challenging environmental conditions.

Low Light Conditions

Radar is not dependent on visible light, making it effective in low-light or night-time conditions where cameras might struggle. This characteristic is crucial for ensuring continuous detection and tracking of VRUs in various lighting scenarios.

Object Speed and Range

Radar is generally better at measuring the speed and range of objects accurately, especially at longer distances. This capability is important for detecting fast-moving or distant VRUs, providing more time for the system to react appropriately. This is a key feature for predicting the trajectory of cyclists and pedestrians in order to predict an imminent collision.



Reduced Sensitivity to Occlusion

Radar can be less sensitive to occlusion caused by obstacles, such as other vehicles or structures, which might obstruct a camera's line of sight. This can be advantageous in complex urban environments where VRUs may be partially hidden by surrounding objects.

Non-Visual Information

Radar provides non-visual information about the environment. It can detect objects even if they do not have a distinct visual appearance, making it useful for detecting VRUs who may not be easily visible to a camera due to clothing, lighting conditions, or other factors.

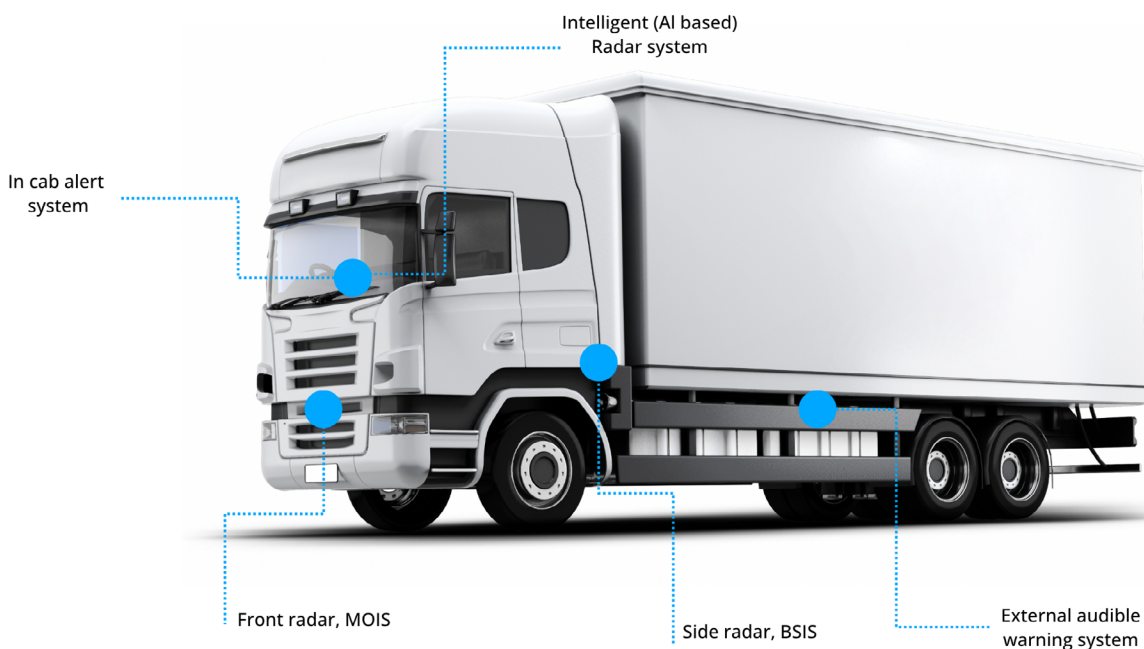
Our system comprises an Artificial Intelligent (AI) based device, two radar modules including time-of-flight and doppler, an alert system for the driver and audible warnings for the VRU. The AI system is capable of accurately distinguishing between VRUs and artefacts including static street furniture and other vehicles. This reduces the number of false positive alerts given to the driver, therefore reducing the potential of cognitive overload.

The system has been designed to detect the presence of VRUs which are either stationary or moving in a trajectory which would place them within the critical blind spot areas of the vehicle. For example, the system tracks a VRU to predict whether they will cross in front of the vehicle from either the nearside or offside direction. This includes monitoring VRUs who are travelling between 3 km/h and 5 km/h and cyclists travelling between 5 km/h and 20 km/h. Furthermore, the system can provide feedback to the driver within 1.4 seconds (the driver reaction time).

When a VRU is detected, the system will issue one of two levels of warnings to the driver; either an informational or warning signal which indicates the level of severity.

- *When stationary or 'at rest', the system will give an informational signal to prompt the driver if a VRU enters the critical blind spots of the vehicle. The state 'at rest' can be determined by the application of the handbrake or footbrake. Our system improves upon this by analysing radar information using AI to detect movement relative to the environment.*
- *When the vehicle is moving, the system will issue a warning signal to the driver which indicates an imminent collision is likely. Even if the vehicle subsequently becomes stationary, the warning signal will persist until the VRU is no longer present.*
- *When both the vehicle and VRU are moving in parallel with each other, then an information signal is given. This is elevated to a warning system when the trajectory between the vehicle and VRU indicates there may be a collision. Again, where a warning signal is given it is not cleared until the VRU is no longer present.*

The system cannot be disabled by the driver and the system will alert the driver to loss of functionality.



Hardware

- Intelligent (AI Based) radar system located within the vehicle.
- An in-cab alert system for the driver drawing attention to the VRU and outside environment.
- Two radars to ensure the full close-proximity blind spots are covered.
- An audible warning to alert the VRU of the vehicle's presence, which can be turned off during sensitive hours.

Progressive Safe System (BSIS+MOIS)

180° MOIS RADAR



BSIS Radar Specifications

ITEM	Parameter	ITEM	Parameter
Rated working voltage (V)	12V/24V	Horizontal angle (°)	180°
Operating voltage range (V)	9-32V	Vertical angle (°)	30°
Power consumption	< 6W	Angle accuracy (°)	±0.5 @ 40°
Operating temperature range (°C)	40 ~ +85°C	Angular resolution (°)	18
Storage temperature range (°C)	40 ~ +95°C	Speed Range (km/h)	-150 ~ +150
Working frequency (GHz)	76-77	Speed Accuracy (m/s)	0.15
Transmit power (dBm)	12	Detectability (m)	65m
Modulation mode	EMCW	Distance Accuracy (m)	0.13
Antenna form	4TX, 4RX	Distance Resolution (m)	0.19
Traceable target numberMAX	31	Waterproof grade	IP67K

MOIS Radar Specifications

ITEM	Parameter	ITEM	Parameter
Rated working voltage (V)	12V/24V	Horizontal angle (°)	180°
Operating voltage range (V)	9-32V	Vertical angle (°)	30°
Power consumption	< 6W	Angle accuracy (°)	±0.5 @ 40°
Operating temperature range (°C)	40 ~ +85°C	Angular resolution (°)	18
Storage temperature range (°C)	40 ~ +95°C	Speed Range (km/h)	-150 ~ +150
Working frequency (GHz)	76-77	Speed Accuracy (m/s)	0.15
Transmit power (dBm)	12	Detectability (m)	65m
Modulation mode	EMCW	Distance Accuracy (m)	0.13
Antenna form	4TX, 4RX	Distance Resolution (m)	0.19
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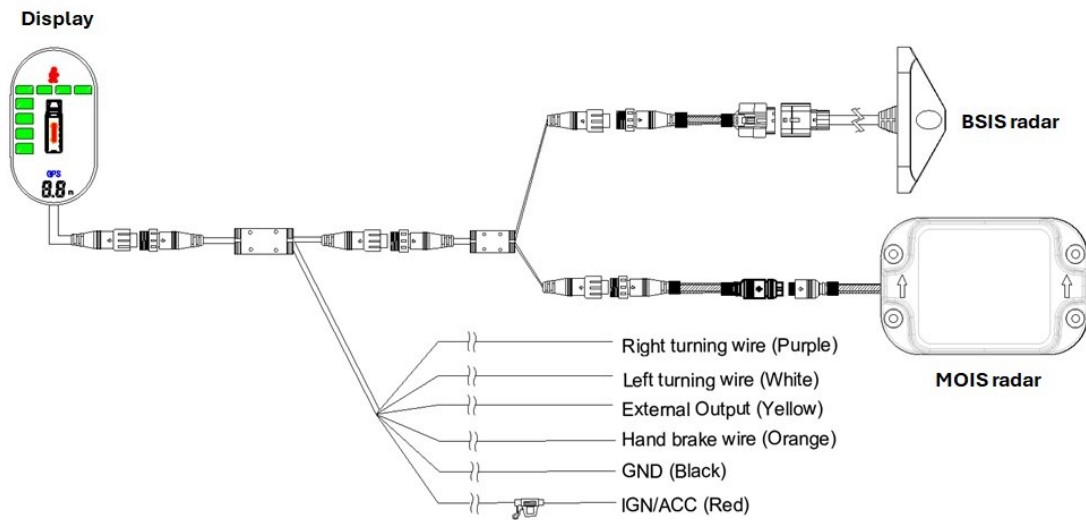
LED Display Specifications

ITEM	Parameter
Rated working voltage (V)	12V/24V
Operating voltage range (V)	9-32V
Working current	< 500mA@12V
Operating temperature range (°C)	40 ~ 80
Storage temperature range (°C)	40 ~ 85
Volume	≥90dB@12V/10cm
Transmit power (dBm)	12
Modulation mode	EMCW
Antenna form	4TX, 4RX
Traceable target numberMAX	31

Approvals



Wiring Diagram



Warning Area

